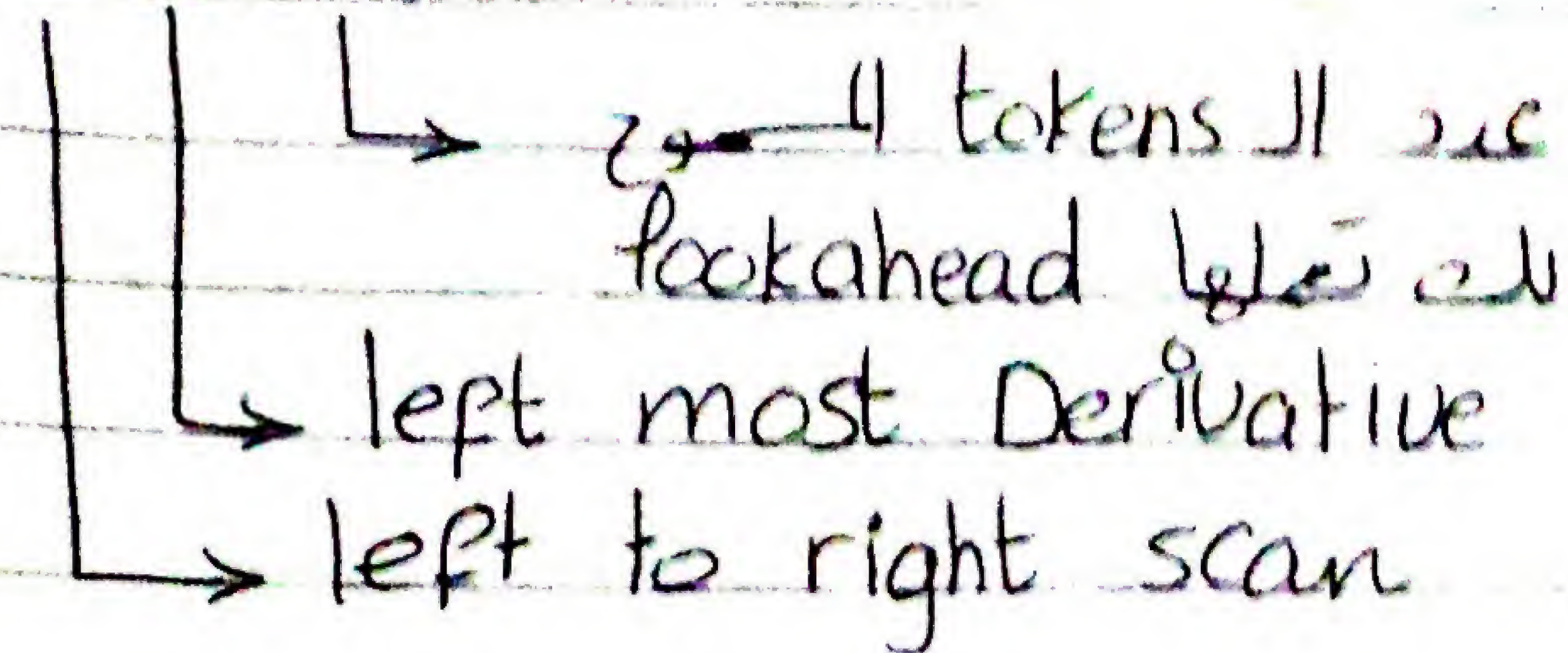


LL(k)



LL(1):

Single production rule is applied at a time

? Left factor slide 6

① nonterminals $E \in T$

② 1 production rule

$$E \rightarrow TX$$

$$X \rightarrow +E \mid \epsilon$$

$$T \rightarrow (E) \mid \text{int } Y$$

$$Y \rightarrow *T \mid \epsilon$$

Quiz slide 8: (d) (south east)

LL(1): 1 production rule \rightarrow cell في الجدول فيها \rightarrow not LL(1) \rightarrow الزمن

Stack	input	Action	Pointer at the top of the stack
E\$	int * int \$ ↑ pointer	TX	Replace & Retain. <div> <div>Pop top of stack</div> <div>Push entry of cell r.h.s of Production rule</div> </div>
<div> <div>TX</div> <div>E</div> <div>\$</div> </div>	<div> <div>int</div> <div>X</div> <div>\$</div> </div>		
TX\$	int * int \$ ↑	int Y	
<div> <div>int</div> <div>Y</div> <div>X</div> <div>\$</div> </div>	<div> <div>Y</div> <div>X</div> <div>\$</div> </div> <div> <div>T</div> <div>X</div> <div>\$</div> </div> <div> <div>Y</div> <div>X</div> <div>\$</div> </div> <div> <div>X</div> <div>\$</div> </div>		
int YX\$	int * int \$ ↑	terminal	Pop & Advance
Pop does match & check done * int YX\$ pointer will advance			
YX\$	* int \$ ↑	*T	
*TX\$	* int \$	terminal	Pop & Advance
TX\$	int \$	int Y	
int YX\$	↑ int \$	terminal	replace
YX\$	\$	ε	replace
X\$	\$	ε	replace
\$	\$	ε	<u>Accept</u>

Quiz slide 16 : ☒

(2nd)

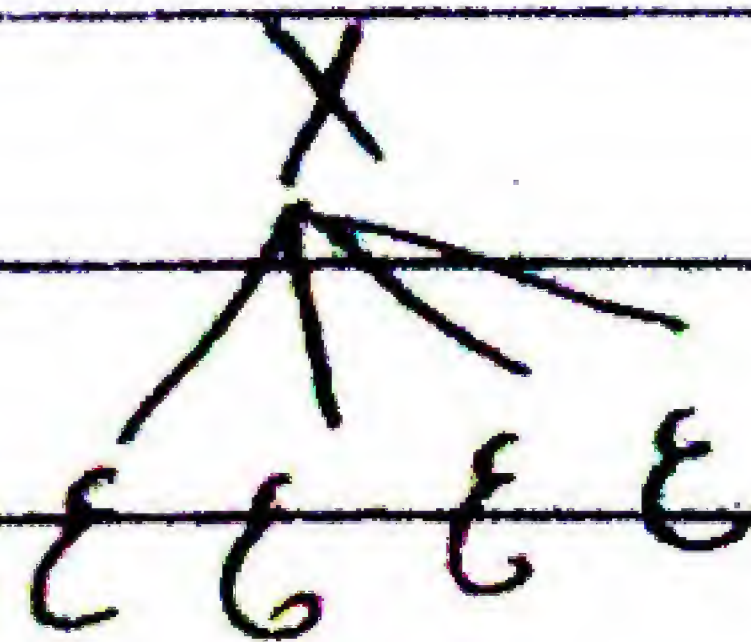
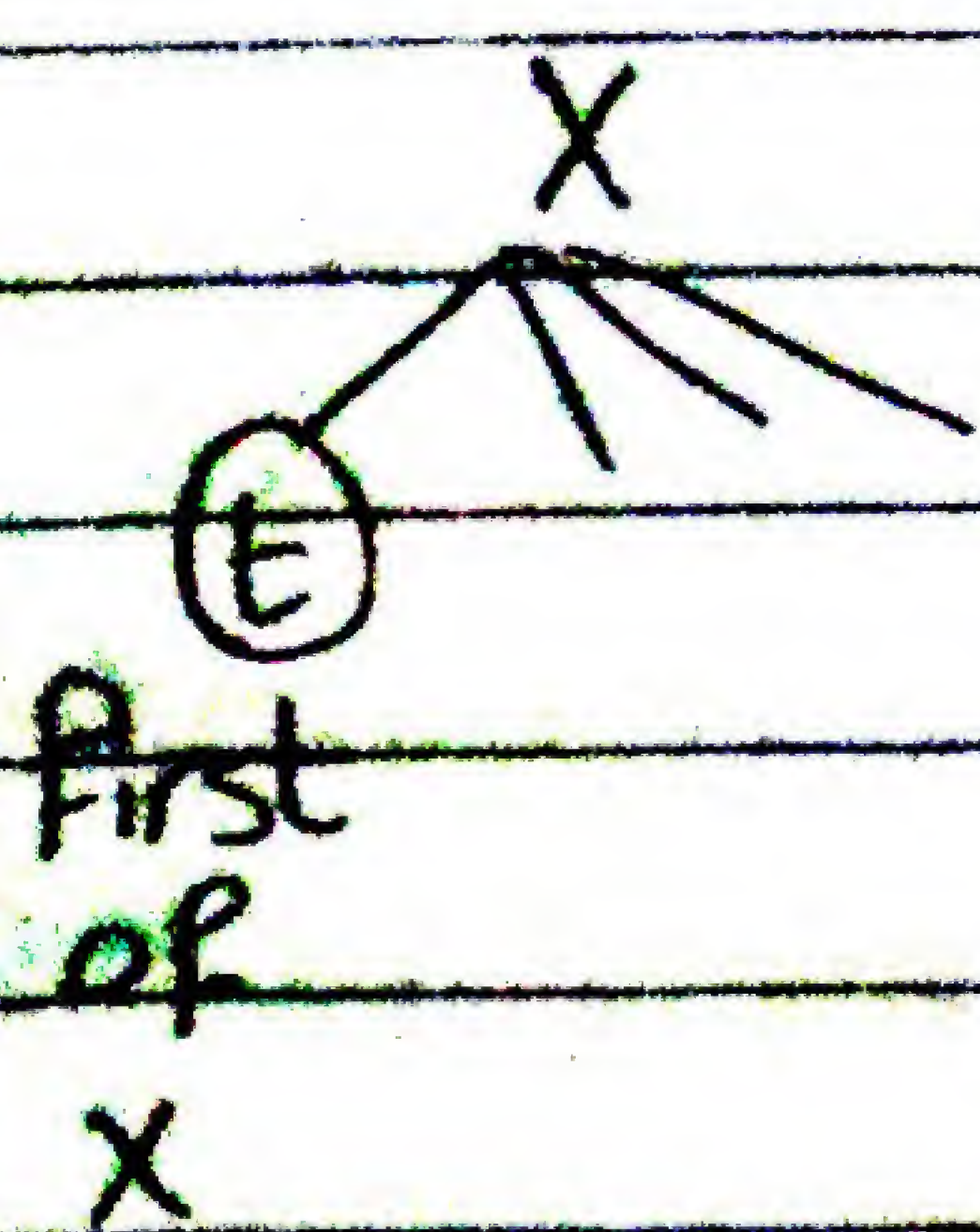
Example 3

int * (int + int)

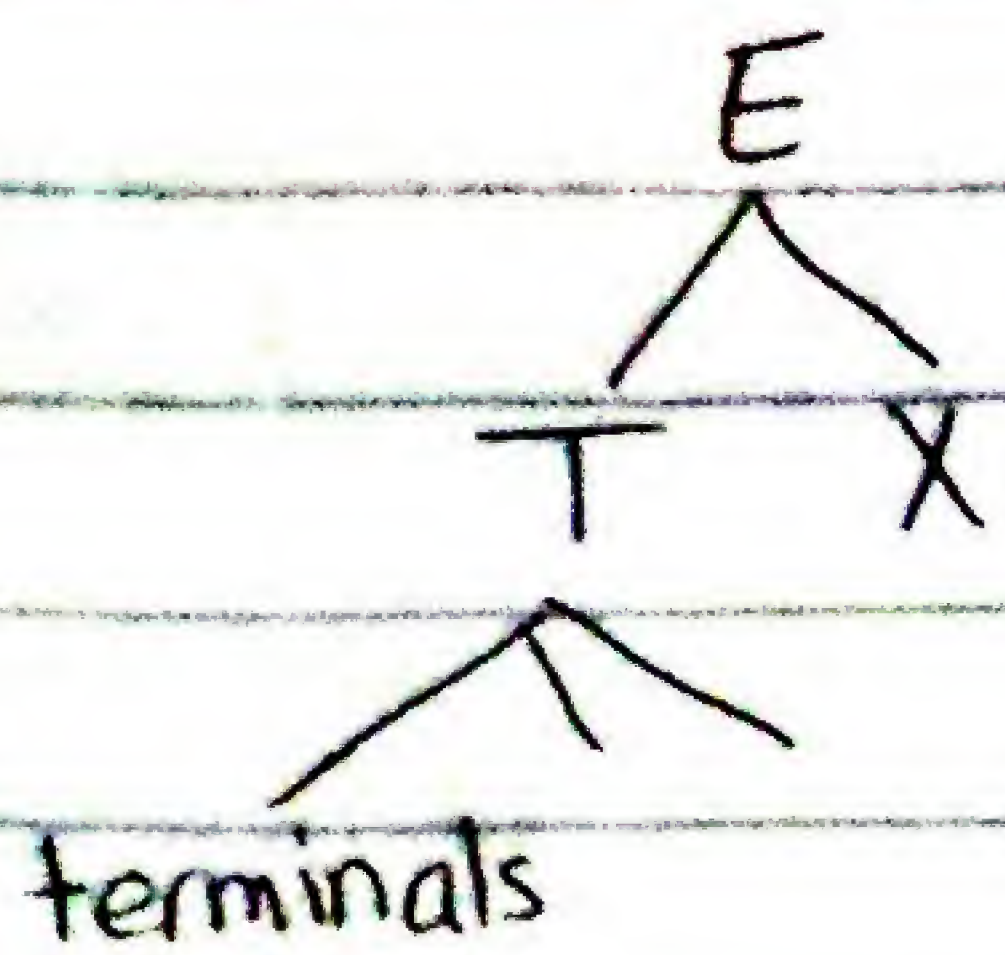
$$\begin{aligned} E &\rightarrow TX \rightarrow \text{int} YX \rightarrow \text{int} * TX \rightarrow \text{int} * (E)X \\ &\rightarrow \text{int} * (TX)X \rightarrow \text{int} * (\text{int} YX)X \\ &\rightarrow \text{int} * (\text{int} X)X \\ &\rightarrow \text{int} * (\text{int} + E)X \\ &\rightarrow \text{int} * (\text{int} + TX)X \\ &\rightarrow \text{int} * (\text{int} + \text{int} YX)X \\ &\rightarrow \text{int} * (\text{int} + \text{int}) \end{aligned}$$

* ال First ليش ال T ب int بق int من ال First
 بقوع T ... لو ليشها وادب (E) بق (من ال First
 بقوع T

terminals no sets are ok \nsubseteq Follows \subset Firsts



∴ $\epsilon \in \text{first of } X$



لو ال Firsts بتاع nonterminal ♥ هو
 * nonterminal بتعبر انه ال Firsts
 بتوع ال * nonterminal الثاني دا ضحينا
 ال Firsts بتوع ال ♥ nonterminal الأول

$$\text{First} (() = \{ (\}$$

$$\text{First} () = \{) \}$$

$$\text{First} (*) = \{ * \}$$

$$\text{First} (+) = \{ + \}$$

$$\text{First} (\text{int}) = \{ \text{int} \}$$

* ال Firsts بتاع ال terminals

في نفسها

$$\text{First} (E) = \{ (, \text{int} \}$$

$$\text{First} (T) = \{ (, \text{int} \}$$

$$\text{First} (X) = \{ + , \epsilon \}$$

$$\text{First} (Y) = \{ * , \epsilon \}$$

$$\text{First} (T) \subset \text{First} (E)$$

* لو عندي 2 nonterminals يبقى ال First للثاني منه ال Follows بتاع الأول

$$\text{Follow} (E) = \{ \$,) \} \cup \text{Follow} (X)$$

$$\text{Follow} (T) = \{ \text{First} (X) - \epsilon \} \cup \text{Follow} (E) = \{ + ,) , \$ \}$$

$$\text{Follow} (X) = \{ \$,) \}$$

$$\text{Follow} (Y) = \{ \text{Follow} (T) \} = \{ + ,) , \$ \}$$

$$\text{Follow} (() = \text{First} (T)$$

$$\text{Follow} () = \text{Follow} (T)$$

$$\text{Follow} (*) = \text{First} (T)$$

$$\text{Follow} (\text{int}) = \{ * , + ,) , \$ \}$$

$$\text{Follow} (+) = \text{First} (E)$$

Construct LL(1) table

ال grammar باق كل production rule ال nonterminal

- ① The parsing table consists of columns (Labeled by the terminals + \$) and rows (Labeled by the nonterminals)
- ② For each grammar rule of the form $A \rightarrow \alpha$ fill in the cells of row A and columns First(A) with α
- ③ For ϵ -grammar rule if $A \rightarrow \epsilon$ Compute Follow(A), fill in the cells that in row A and columns Follow(A) by ϵ

	()	+	*	int	\$
E	TX				TX	
T	(E)				int Y	
X		ϵ	+E			ϵ
Y		ϵ	ϵ	*T		ϵ

$$\text{First}(E) = \{ (, \text{int} \}$$

في الامتحان فتنظروا LL(1) grammar لو هتلا LL(1) في الامتحان فتنظروا LL(1) Left factor واحد

عشان انا كانه LL(1) table لو كل cell فيها production rule واحد يبقى LL(1)

Exo

$$S \rightarrow Sa \mid b$$

	a	b	\$
S		Sa ①	
		b ②	

↓
کے لیے 2 rule
LL(1) نیچر مست